Theoretical investigations for testing the fundamental symmetries of the Standard Model with diatomic molecules

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DOI:
10.33612/diss.127488441

Propositions

accompanying the PhD thesis

Theoretical investigations for testing the fundamental symmetries of the Standard Model with diatomic molecules

by

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1. It is impossible to solve the equations analytically and to describe the behavior of the electrons comprehensively in diatomic molecules without making any approximations. However, numerical methods allow us to carefully examine the electronic structure and clearly understand the possible properties of such molecules.
2. If theoretical uncertainties, mainly arising from unknown or imperfect information within the computational approach, are not acknowledged, any claimed high-accuracy calculations would be meaningless.
3. Besides the direct search for new physics at high-energy colliders, molecular experiments provide a complementary and economical way of searching for new physics, because the basic facility for research in molecular physics is usually much smaller.
4. Theoretical efforts with molecules have great potential for enabling detection of new physical phenomena and can thus lead to new insights on the problems that cannot be answered by the Standard Model (SM).
5. Theoretical investigations of molecular properties not only can help develop the experimental setups for precision measurements, but are also needed for the interpretation of such experiments.
6. When facing various challenges in research, computers can always provide researchers with important assistance, as computers are able to memorize things fast, recall information efficiently, do tedious calculations easily, and work hard without exhausting themselves.
7. In academic research, we have, first, Measurement; second, Estimation; third, Calculation; fourth, Comparison; fifth, Conclusion. (adapted from *The Art of War* by Sun Tzu: 兵法：一曰度，二曰量，三曰數，四曰稱，五曰勝)
8. A research plan should be made as flexible as possible, because it is difficult to predict the future, especially in natural science.